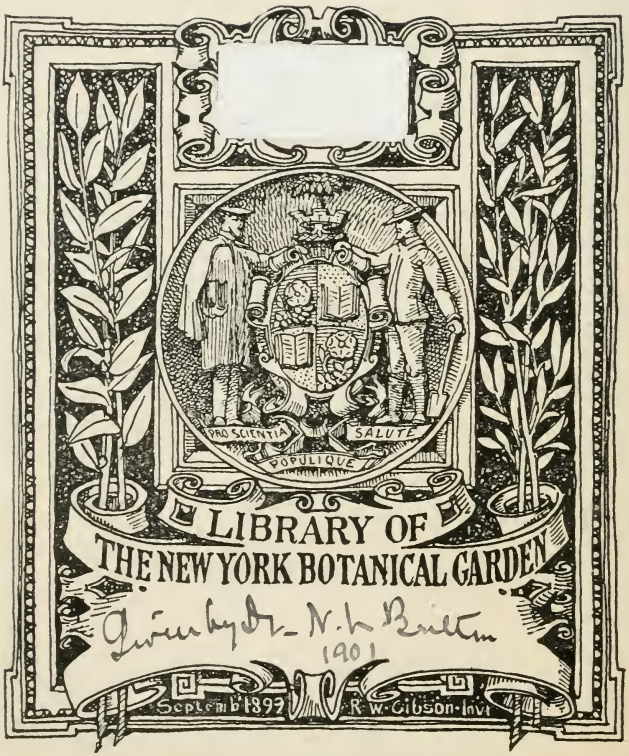
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Canadian Pleistocene Flora and Fauna.—Report of the Committee, consisting of Sir J. W. Dawson (*Chairman*), Professor D. P. Penhallow, Dr. H. Ami, Mr. G. W. Lamplugh, and Professor A. P. Coleman (*Secretary*), *reappointed to continue the investigation of the Canadian Pleistocene Flora and Fauna.*

During the past year the Committee has suffered a severe loss through the death of its distinguished chairman, Sir J. W. Dawson, but the work has been continued by three of its members. Dr. Ami has taken charge of the Ottawa valley deposits, Professor Penhallow has examined the fossil flora from both Ottawa and Toronto, and the Secretary has continued his investigations near Toronto. The following report on the Pleistocene near Toronto has been prepared by the Secretary, and that on the Flora of the Don Valley by Professor Penhallow.

I. *On the Pleistocene near Toronto. By* Professor A. P. Coleman.

Since the preparation of the last report two new localities near Toronto have proved of interest, one near a bend of the Don a little east of the well reported on last year, the other a series of sand deposits in the western part of the city. The outcrop at the bend of the Don just north-west of Toronto was discovered years ago by Dr. G. J. Hinde, who had described so excellently the section at Scarborough Heights, and who has been good enough to hand over his material to the Secretary. Until last year, however, it was not certainly proved to be interglacial. The section at the bend of the Don is of special interest, since it occupies an interglacial valley about 700 feet wide, having steep walls of Hudson River (Cambro-silurian) shale, rising 8 or 10 feet on the eastern side and 16 feet on the western. The section is as follows :—

4. Coarse gravel with boulders and no shells, 4 to 8 feet . .	37 to 40
3. Brown clay with sandy layers containing unios, &c., 4 or 5 feet	33 or 34
2. Blue clay with sandy layers containing shells and wood, 6 feet	29
1. Coarse shingle with clay and peaty layers, 4 feet . . .	23
River Don, above level of Lake Ontario	19

The lowest layer goes below the level of the Don, so that the bottom of the section is not exposed. The third layer corresponds exactly in materials and fossils with the unio beds referred to in last year's report, which are in place 100 yards to the west, and there overlie a thin sheet of boulder clay resting on a cliff of shale 16 feet in height. Beds 1 and 2 contain trees of a warm climate, as determined by Professor Penhallow, and twelve species of freshwater shells, according to determinations kindly made by Dr. Dall of the Smithsonian Institution, Washington, two of the shells, *Unio* (*Quadrula*) *pyramidata* and *Anodonta grandis*, being new to the Toronto formation.

The most important feature of this section is the evidence afforded that

a period of erosion, during which the floor of Hudson River shale was cut down more than 16 feet, preceded the deposit of the lowest warm climate beds. This, with the downward extension of the interglacial beds, as described in previous reports, for at least 15 feet, lengthens the time necessary for the interglacial episode considerably.

The new deposits in the western part of the city are exposed partly in cuttings for sewers, but chiefly in two large sandpits, now worked energetically because of the increase of building operations in Toronto. These exposures lie from three to four miles west of the Don and are either interglacial or preglacial, since more or less boulder clay overlies them, though wave-action on the old Iroquois shore, 160 feet above the present Lake Ontario, has removed part of the overlying till.

Sections at the sandpits near Christie and Shaw Streets show 30 to 40 feet of sand and gravel tumultuously cross-bedded, as if formed in a rapidly flowing river or near the shore of a large lake. The upper part of the stratified sand is often contorted and broken into irregular masses immediately under the till. The more gravelly layers contain a few shells, chiefly *Campeloma decisa*, *Valvata sincera*, species of *Pleurocera* and *Sphaerium*, and occasionally fragments of unios. A few mammalian remains have occurred also, fragments of a tusk of mammoth or mastodon, and an atlas vertebra of an animal not smaller than an ox, having been found within the past year. The latter bone could not be determined by comparison with the skeletons at hand in the Biological Museum of Toronto University, and so was sent by Mr. Archibald Pride of the Biological Museum, to whom it had been referred, to his brother in Dublin. There it was considered to belong probably to *Bison americanus*. Toronto is the most easterly locality in Canada where remains of this inhabitant of the prairies have been found.

As these stratified sands differ greatly from any of the interglacial beds of the Don or Scarborough, though underlying apparently the same sheet of till, it seemed possible that they were preglacial. To settle this point it was decided to sink a well to bed rock from the bottom of the Christie Street sandpit, using the grant of 10*l.* to the Committee for this purpose. As the sand below the bottom of the pits is heavily charged with water, it was necessary to drill the well and sink a pipe as the work progressed. After thirty-eight feet of rather uniform sand had been penetrated, a layer of cemented gravel or conglomerate put an end to the work with the appliances employed.

Another well was sunk half a mile to the south, near a stream which had cut through forty feet of till. Here the drill reached the underlying Hudson River shale, giving a complete section of the drift, as follows :

	ft.	in.	ft.	in.
Till, blue clay with a few scratched stones	40		99	
Fine and coarse gray sand	14		59	
Clay without stones	9	3	45	
Gravel (loosely cemented)	2	6	35	9
Clay without stones	2	9	33	3
Sand and gravel	13	6	30	6
Hudson River Shale			17	
Level of Lake Ontario			0	

As no boulder clay was found beneath the sand, the question remained undecided whether the beds are interglacial or preglacial ; but the opening of a sewer on Dupont Street, half a mile north-east of the sandpits, has

since provided evidence favouring the interglacial age of the sands. At the sewer stratified sand, evidently a continuation of the deposits just mentioned, contains clayey sheets with thin bands of peaty material containing remains of beetles, mosses, seeds, plates of mica, &c., precisely like the peat from the cold climate series of Scarborough and the Don valley. Since these peaty layers are probably equivalent in age to the peaty clays east of the city, we may suppose that the sandy deposits of the western part of Toronto are also interglacial, in the upper part evidently belonging to the cold climate series, but perhaps representing the warm climate deposits at lower levels. It is clear that the conditions in Western Toronto must have been different from those to the east, since here a great thickness of stratified sand replaces stratified clay. This may be explained by supposing that an interglacial Humber river brought from the west sand and gravel into the great lake then occupying the Ontario Valley to mingle with the clayey delta materials of the interglacial Laurentian river flowing from Georgian Bay to Scarborough.

Just beneath a thin sheet of till in the Dupont Street sewer the upper end of the ulna of a mammoth or mastodon was found, the bone having been polished and scratched by glacial action, suggesting that it lay on the surface when the ice advanced for the last time. Some pieces of wood occurred near by, but lower down in the section.

We may now sum up the results obtained by the Committee and former investigators of the Toronto formation, so as to show the series of events recorded, the thickness of the deposits, and the fossils obtained from them.

In most places the Toronto formation is found to overlie a bed of characteristic boulder clay containing rocks brought from long distances to the north or north east, and covering the eroded surface of the Cambro-silurian rocks of the region. This boulder clay probably belongs to the Iowan till sheet of the United States. After the retreat of the ice there was an interval of erosion shown near Shaw Street, and in the interglacial river valley at the bend of the Don ; followed by the deposit of clay, sand, and gravel containing trees and unios of a warmer climate than the present, the greatest thickness amounting to thirty-three feet in the Don valley, and to thirty-five feet below Lake Ontario at Scarborough.

These beds have nowhere been found at a higher level than fifty feet above Lake Ontario, and the upper sands and gravels were probably laid down in shallow water, since they are browned and sometimes cemented with oxide of iron.

Conformably upon the warm climate beds are a series of beds containing trees and other fossils, especially beetles, suggesting a cooler climate than the present ; not Arctic, however, but cold temperate. These are best shown at Scarborough Heights, where stratified peaty clays starting a few feet below the level of Lake Ontario have a thickness of ninety-five feet, followed by fifty-five feet of stratified sand. It is probable that part at least of the seventy feet of sand found in the western part of Toronto is of the same age. The interglacial lake at this stage must have stood at least 150 feet higher than Lake Ontario.

A long period of erosion followed the draining of this lake, during which river valleys a mile or more in width were cut through the delta deposits at Scarborough to the depth of more than 150 feet comparable to those cut by the Don and Humber since the Glacial period.

Finally a fresh advance of the ice, probably belonging to the Wisconsin

stage of American geologists, covered the Toronto formation with a complex series of layers of boulder clay and stratified sand and clay reaching a thickness of 200 feet at Scarborough Heights.

Accounts of the fossils of the Toronto formation have been given in previous reports of this Committee and in various articles in geological journals, but in this final report it is thought wise to give a more complete list of the species collected, including a large number that have not yet been published. As the trees will be taken up in Professor Penhallow's report, the present list is confined to the interglacial fauna. The forms occurring in the lower, warm climate beds will be given first, and afterwards those of the cool climate.

Fauna of Warm Climate Beds, Don Valley.

Vertebrata: possibly mammoth or mastodon and bison, and an undetermined fish.

Arthropoda: several undetermined beetles and cyprids.

Mollusca:

Unio undulatus
„ rectus
„ luteolus
„ gibbosus
} still living in Lake Ontario.

„ phaseolus
„ pustulosus
„ trigonus
} still living in Lake Erie, but not reported from Lake Ontario.

„ occidens
„ solidus
„ clavus
„ pyramidata
} not known in the St. Lawrence system of waters, but living further south.

Anodonta grandis, not reported from Canada.

Sphaerium rhomboideum
„ striatinum
„ sulcatum
„ solidulum
„ similis (?)
Pisidium Adamsi
„ compressum
„ novaboracense (?)
Pleurocera subulare
„ elevatum
„ Lewisi (?)
Goniobasis depygis
„ Haldemani
Limnaea decidiosa
„ elodes
Planorbis parvus
„ bicarinatus
Amnicola limosa
„ porata
„ sagana
Physa heterostropha
„ ancillaria
Succinea avara
Bythinella obtusa
Somatogyrus isogonus
Valvata sincera
„ tricarinata
Campeloma decisa
Bifidaria armata (land snail)

In all there are thirty-eight undoubted species of molluscs, and three more probably, included in the fauna. Of these eight or ten have not been reported from Lake Ontario, but occur further south.

Fauna of Cool Climate, chiefly from Scarborough.

Vertebrata : Caribou, and perhaps mammoth or mastodon and bison.
Arthropoda (almost wholly beetles) :

Carabidae (9 gen., 34 sp.).

Elaphrus irregularis
Loricera glacialis
„ lutosa
„ exita
Nebria abstracta
Bembidium glaciatum
„ Haywardi
„ vestigium
„ vanum
„ praeteritum
„ expletum
„ damnosum
Patrobus gelatus
„ decessus
„ frigidus
Pterostichus abrogatus
„ destitutus
„ fractus
„ destructus
„ gelidus
„ depletus
Badister antecursor
Platynus casus
„ Hindei
„ Halli
„ dissipatus
„ desuetus
„ Harttii
„ delapidatus
„ exterminatus
„ interglacialis
„ interitus
„ longaevus
Harpalus conditus

Dytiscidae (3 gen., 8 sp.).

Coelambus derelictus
„ cribrarius
„ infernalis
„ disjectus
Hydroporus inanimatus
„ inundatus
„ sectus
Agabus perditus

Gyrinidae (1 sp.).

Gyrinus confinis LeC.

Hydrophilidae (1 sp.).

Cymbiodyta exstincta

Staphylinidae (11 gen , 19 sp.).

Gymnusa absens
Quedius deperditus
Philonthus claudus
Cryptobium detectum
„ cinctum
Lathrobium interglaciale
„ antiquatum
„ debilitatum
„ exesum
„ inhibitum
„ frustum
Oxyporus stiriacus
Bledius glaciatus
Geodromicus stiricidii
Acidota crenata, Fabr. (*var.* nigra)
Arpedium stillicidii
Olophrum celatum
„ arcanum
„ dejectum

Chrysomelidae (1 gen., 2 sp.).

Donacia stiria
„ pompatica

Curculionidae (4 gen., 6 sp.).

Erycus consumptus
Anthonomus eversus
„ fossilis
„ lapsus
Orchestes avus
Centrinus disjunctus

Scolytidae (1 sp.).

Phlocosinus squalidens

Mollusca :

Sphaerium rhomboideum
„ fabale
Limnaea sp.
Planorbis sp.
Valvata tricarinata

If the sand deposits of Western Toronto are to be included with the cool climate beds, there must be added :

Campeloma decisa	Amnicola limosa
Pleurocera, two species	Valvata sincera
Goniobasis, one species	Unio, one species

These fossils may, however, belong to the lower warm climate series. The molluscs do not give decisive information as to the climate ; but the trees, and to a considerable extent the insects, point to a climate somewhat cooler than at present.

Dr. Samuel H. Scudder has determined these beetles, seventy-two in number, all of them in his opinion extinct except two. Twenty-five of them were obtained from material sent by Dr. Hinde, the rest from specimens collected at Scarborough and Toronto by A. P. Coleman. A complete account of the new species, with figures, will be published shortly by the Canadian Geological Survey. The new species confirm Dr. Scudder in the opinion expressed when the first set of specimens was described, 'that on the whole the fauna has a boreal aspect, though by no means so decidedly boreal as one would anticipate under the circumstances.' The Committee warmly appreciates the kindness and patience of Dr. Scudder in working up this fragmentary and difficult material.

In all at least seventy-eight species of animals are known from the cool climate beds, seventy of them extinct, and the total number may reach eighty-seven ; while in the lower warm climate beds at least fifty species are known to exist. Only four of the seventy-eight species recognised in the upper beds occur also in the lower beds ; so that 124 species of animals, chiefly insects and molluscs, but including also the caribou, bison, and mammoth or mastodon, have been found in the Toronto interglacial formation. If we include the flora, with its numerous forest trees, it will be seen that there are ample materials for reconstructing the life of the time and for determining the climate. That the Toronto formation is interglacial has been proved beyond doubt, and that it represents an interglacial period lasting thousands of years is scarcely doubtful. Two points are of special importance in this connection. In the first place, there was a considerable interval of erosion after the earlier withdrawal of the ice before the warm climate beds began to be deposited, and there was a long time of active erosion after the cool climate beds had been formed before the ice advanced for the second time. These times of erosion, with the long intervening time when the valley of Lake Ontario was filled with fresh water to a depth of 50 to 150 feet greater than at present, demand not only a great lapse of time but also important warpings and changes of level in the St. Lawrence valley. In the next place it is striking that none of the scores of species of plants and animals found is characteristic of an Arctic or even sub-Arctic climate. All of them might live in Ontario to-day except a few which require a warmer climate, *i.e.* they all belong to climates ranging from warm temperate to cold temperate, meaning by the latter the climate of the north shore of Lake Superior or of the lower St. Lawrence. The deposits seem to have been formed, not during the earlier retreat of the ice, nor during its second advance, but during a temperate era, when in all probability eastern Canada was as devoid of permanent icefields as it is to-day. Our investigations go far to prove that between the two

advances of the ice there was a long temperate interval during which even the heart of Labrador, 700 miles to the north-east, must have been free from glaciers.

II. *The Pleistocene Flora of the Don Valley. By* Prof. D. P. Penhallow.

Special studies relative to the pleistocene flora of Canada have now been carried on since 1889, the first report on the subject having been made by Dawson and Penhallow in 1890.[1] Other contributions have been made from time to time, but upon the occasion of the meeting of the British Association at Toronto in 1897 a special impetus was given to this work by the appointment of a Committee, to whom a grant was made for the purposes of investigation, particularly in the neighbourhood of Toronto. Under these favourable conditions much material has been brought together, chiefly from the immediate vicinity of Toronto, and its determination has thrown much important light upon the climatic conditions of the various geological phases through which that region evidently passed in interglacial times. During the past decade or more, other important material has been gathered from various localities—often most widely separated—throughout the Dominion. As the work of the Committee is now practically completed, it is considered wise, in this final report, to bring together all the information from these various sources and endeavour to ascertain its bearing upon questions of current interest and importance.

Plants from eighteen special localities have been studied, ranging from Manitoba to Cape Breton, and particular attention has been directed to those from at least twelve of these locations, chiefly from the vicinity of Toronto.

Eighty-three species in all have been studied, the largest number from any one locality (Taylor's Brickyard) being twenty-seven. In several instances only one or two species have been obtained from a locality, in which cases they afford no definite conclusions respecting the climatic conditions of the locality ; but in other cases the character of the vegetation is such as to leave no room for doubt as to the climatic conditions involved. In the Valley of the Don, numerous collections from the same localities have resulted in a constant diminution in the number of discoveries, until latterly the total absence of anything new has brought the conviction that the flora of the region has been exhausted, and an inspection of the accompanying table will at once serve to disclose the extent of the flora in each locality examined. The explorations of the past year have added nothing new to our knowledge of the flora of these localities, since the various plants found have proved to be only such as had been previously determined. There is therefore little to be added to the observations made in previous years, but attention may be directed to a few considerations of interest which appear upon comparison of the various localities studied.

Of the eighteen localities under observation, five are so distant from one another and from all others as to bear no obvious relation to each other, or else the plant-remains are so few as to render them of little value except from the general standpoint of geographical range. These localities are Cape Breton, Rolling River (Manitoba), Solsgirth and Leda

[1] *Bull. Geol. Soc. Amer.* I. (1890), pp. 311–334.

River (Manitoba), and Moose and Missinaibi Rivers. The remaining thirteen localities are so situated as to bear a more or less definite relation to one another, and all lie within the limits of the Pleistocene Sea which extended up the valley of the St. Lawrence, and occupied the area of the present Great Lakes. It should be kept in mind in this connection, however, that salt water forms are to be met with only as far west as Green's Creek, near Ottawa, while fresh water types prevail in all the more western localities, which thus correspond in a general way with the deposits of Ohio, Indiana, Illinois, Minnesota, Manitoba, and other western regions.

Distribution of Pleistocene Plants.

—	Erie Clays	Cape Breton	Rolling River, Manitoba	Solsgirth, Manitoba	Leda River, Manitoba	Moose and Missinaibi Rivers	Don Valley										
							Bottom of Logan's Clay	Don River	Gaol Farm	Taylor's	Price's	Simpson's	Bend of Don	Scarborough	Green's Creek	Besserer's Wharf	Montreal
Abies balsamea														*			
Acer pleistocenicum								*		*							
„ saccharinum															*		
„ spicatum								*		*							
Algae sp.															*		*
Alnus sp.															*		
Asimina triloba									*								
Betula lutea																*	
Brasenia peltata															*		
Bromus ciliatus															*		
Carex aquatilis														*			
„ magellanica															*		
„ reticulata														*			
Carya alba								*	*	*							
Cocconeis sp.			*														
Chamaecyparis sphaeroidea									*	*							
Crataegus punctata								*		*							
Cyperaceae sp.										*					*	*	
Distichium capillaceum						*											
Drosera rotundifolia															*		
Elodea canadensis			*												*	*	
Encyonema prostratum			*												*	*	
Equisetum limosum															*		
„ scirpoides															*		
„ sylvaticum															*		
„ sp.														*			
Eriocaulon sp.								*		*							
Fontinalis sp.														*	*		
Fucus digitatus															*	*	
Fraxinus quadrangulata								*									
„ sambucifolia										*							
„ americana										*							
Festuca ovina									*	*							
Gaylussacia resinosa															*		
Gramineae sp.															*		
Hypnum commutatum														*			
„ fluitans																*	
„ recurvans						*											

Distribution of Pleistocene Plants—continued.

—	Erie Clays	Cape Breton	Rolling River, Manitoba	Selsgirth, Manitoba	Leda River, Manitoba	Moose and Missinabi Rivers	Don Valley: Bottom of Leda? Clay	Don Valley: Don River	Don Valley: Gael Farm	Don Valley: Taylor's	Don Valley: Price's	Don Valley: Simmons'	Don Valley: Head of Don	Scarborough	Green's Creek	Bessner's Wharf	Montreal
Hypnum revolvens									*					*			
„ sp.									*								
Juniperus virginiana									*	*			*				
Larix americana						*				*	*	*		*			*
„ churchbridgensis				*													
Liemophora sp.			*														
Lycopodium sp.						*											
Maclura aurantiaca								*	*	*			*				
Menyanthes trifoliata																	*
Navicula lata			*														
Oryzopsis asperifolia															*		
Oxycoccus palustris														*			
Picea alba														*			
„ nigra	*					*	*	*	*	*	*						*
„ sp.								*									
Pinus strobus											*						
Platanus occidentalis								*		*							
Populus balsamifera								*		*					*	*	
„ grandidentata								*		*					*		*
Potamogeton pectinatus															*	*	
„ perfoliatus															*	*	
„ pusillus															*	*	
„ rutilans															*	*	
„ natans										*							
Potentilla anserina															*	*	
Prunus sp.										*							
Quercus obtusiloba								*									
„ alba (?)									*								
„ rubra									*				*				
„ tinctoria										*			*				
„ oblongifolia													*				
„ macrocarpa									*	*							
„ acuminata										*							
Robinia pseudacacia									*	*							
Salix sp.								*		*				*			
Taxus canadensis		*	*	*				*									
Thuya occidentalis					*					*							
Tilia americana									*	*							
Typha latifolia																*	
Ulmus americana								*	*	*							
„ racemosa								*									
Vaccinium uliginosum													*				
Vallisneria spiralis			*												*	*	
Zostera marina																	*
Totals	1	1	7	2	1	6	1	17	14	27	3	1	5	14	24	14	7

The most easterly of the localities in the related deposits is Montreal. The majority of the specimens recovered at this point represent drift material brought down by tributary rivers, but the great abundance of *Zostera marina* and the occurrence of Algae show that some of the plants at least were deposited in place. The matrix is a blue clay. Seven species in all have been recovered from this locality, and they are all

identical with species now common in the same district—except, of course, *Zostera*—thus indicating similar climatic conditions.

At Green's Creek, near Ottawa, and at Besserer's Wharf, a few miles below on the Ottawa River, numerous plant remains are found enclosed in clay nodules, but their very fragmentary character often renders their determination most unsatisfactory. These two localities, although separately treated, are in reality one and the same, since the deposit at each place is of the same nature, and was undoubtedly laid down at the same time, and they have proved to be among the richest in plant remains of all the localities studied—no less than twenty-eight species having been recovered from the clay nodules. An analysis of this flora shows 35·71 per cent. of the plants to be wholly aquatic, and therefore deposited in place. 35·71 per cent. are land plants, drifted in by tributary rivers, and 28·57 per cent. represent semi-aquatics and marsh plants from adjacent land areas. The vegetation, as a whole, is identical with that now found in the same region, from which we may infer similar climatic conditions.

At Scarborough Heights, near Toronto, the flora is rather remarkable for the complete absence of aquatic types, showing the drift character of the entire deposit. Fourteen species in all have been found there, and of these six are trees, while the remaining eight embrace mosses, equiseti, and herbaceous or half-shrubby plants. The vegetation as a whole is of a decidedly more boreal type than that now flourishing in the same region, and, if anything, somewhat more northern than that which is to be found in the deposits at Green's Creek and Montreal. This points to a climate equivalent to that of northern Quebec and Labrador, as we know it to-day, and somewhat colder than the climate at Green's Creek and Montreal during Pleistocene time.

In the Don Valley no less than eight separate localities have been examined. Some of them, as at Simpson's, proved practically barren of results so far as plant remains were concerned, owing to the uncontrollable influx of water. Others again, as at Taylor's Brickyard and the Don River, proved to be exceptionally rich in material, and afforded some of the most valuable results obtained. Within this area no less that thirty-eight species have been recovered, and they point conclusively to the existence of climatic conditions differing materially from those which now prevail, and of a character more nearly allied to that of the middle United States of to-day.

The Erie Clays at Hamilton, Ontario, have afforded only one example of plant life, and this does not materially aid us in any conclusions relative to climatic conditions, since it is a type having a somewhat wide range within the warmer zone, represented by the more southern types of the Pleistocene flora.

Only one species appears to have disappeared in Pleistocene time. *Acer pleistocenicum*, which was abundant in the region of the Don, bears no well-defined resemblance to existing species. With this one exception, it is a noteworthy fact that all the plants of the Pleistocene flora were such as are now represented in the same localities, or, in the case of the Don Valley, by plants which find the northern limits of their distribution at or near that region, and the somewhat unequal distribution thus indicated at once suggests definite climatic changes during Pleistocene time, as represented by the northern and southern migration of particular types of plants. This has already been referred to in previous reports and publications, but it may be repeated at this time that the definite and abundant occurrence of *Maclura aurantiaca*, *Juniperus virginiana*, *Quercus obtusi-*

lola, *Quercus oblongifolia*, *Asimina triloba*, *Chamaecyparis sphaeroidea*, and *Fraxinus quadrangulata* points without question to the prevalence of a much warmer climate than now prevails, while, on the other hand, the equally abundant occurrence of boreal types at Scarborough points to the existence of a colder climate at the time these deposits were laid down. It is therefore clear that in the region of Toronto during Pleistocene time there were at least two distinct periods, characterised, on the one hand, by a climate equivalent to that of the middle United States at the present day, and, on the other hand, a climate equivalent to that of northern Quebec and Labrador. According to stratigraphical evidence obtained by Professor Coleman, these changes followed the recession of the ice sheet in the order given, from which we are to conclude that the climate of the Don Valley is now intermediate between that of the first and second periods, approaching the former.

On the other hand, again, the flora of Green's Creek and Besserer's, as also that of Montreal, is practically identical with that now existing in the same localities. It thus represents a climate colder than that of the Don period, but somewhat warmer than that of the Scarborough period, but present evidence does not enable us to ascertain if these deposits were laid down before or after the Scarborough deposits. The following summary will probably assist in conveying a clearer idea of the distinctive differences in the vegetation of these three periods.

	Don Period, Warm Climate	Scarborough Period, Cold Climate	Green's Creek Period, Mild Climate
Abies balsamea		*	
Acer pleistocenicum	*		
Acer saccharinum			*
Acer spicatum	*		
Algae sp.			*
Alnus sp.		*	
Asimina triloba	*		
Betula lutea			*
Brasena peltata			*
Bromus ciliatus			*
Carex aquatilis		*	
„ magellanica			*
„ reticulata		*	
Cara alba	*		
Chamaecyparis sphaeroidea	*		
Crataegus punc ata	*		
Cyperaceae sp.	*		*
Drosera rotundifolia			*
Elodea canadensis			*
Encyonema prostratum			*
Equisetum limosum			*
„ scirpoides			*
„ sp.		*	
„ sylvaticum			*
Eriocaulon sp.	*		
Fontinalis sp.		*	*

Summary—continued.

	Don Period, Warm Climate	Scarborough Period, Cold Climate	Green's Creek Period, Mild Climate
Fucus digitatus			*
Fraxinus quadrangulata	*		
„ sambucifolia	*		
„ americana	*		
Festuca ovina	*		
Gaylussacia resinosa			*
Gramineae sp.			*
Hypnum commutatum		*	
„ fluitans			*
„ revolvens		*	
„ sp.	*		
Juniperus virginiana	*		
Larix americana	*	*	
Lycopodium sp.		*	
Maclura aurantiaca	*		
Oryzopsis asperifolia			*
Oxycoccus palustris		*	
Picea alba		*	
„ nigra	*		
„ sp.	*		
Pinus strobus	*		
Platanus occidentalis	*		
Populus balsamifera	*		*
„ grandidentata	*		*
Potamogeton pectinatus			*
„ perfoliatus			*
„ pusillus			*
„ rutilans			*
„ natans	*		
Potentilla anserina			*
Prunus sp.	*		
Quercus obtusiloba	*		
„ alba (?)	*		
„ rubra	*		
„ tinctoria	*		
„ oblongifolia	*		
„ macrocarpa	*		
„ acuminata	*		
Robinia pseudacacia	*		
Salix sp.	*	*	
Taxus canadensis	*		
Thuya occidentalis	*		
Tilia americana	*		
Typha latifolia			*
Ulmus americana	*		
„ racemosa	*		
Vaccinium uliginosum		*	
Vallisneria spiralis			*
Zostera marina			*
Totals	38	14	29

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